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(57) Abstract

Disclosed is a method for delivering aroma comprising the step of applying water to a mixture of an effective amount of an aromatic ingredient, an exothermic ingredient, and a pH adjusting agent, thereby causing the temperature of the mixture to rise and resulting in volatilization of the aromatic ingredients.

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METHOD FOR AROMA DELIVERY

FIELD

The present invention relates generally to the field of methods of delivering aroma. More particularly, the present invention relates to methods for aroma delivery generated by an exothermic reaction.

BACKGROUND

Aromatic volatile components have been widely used in variety of products, including pharmaceutical products. Certain types of aromatic volatile components (*e.g.*, menthol, eucalyptus oil, camphor, thymol) are known for treatment and therapy of common colds to relieve congestion and blocked nose. Many consumers suffering from colds or allergies and having some associated symptoms, for example, blocked nose and cough, tend to use pharmaceutical products made with such aromatic volatile components. These pharmaceutical products are commonly used by inhaling aroma vapours along with water vapours to relieve blocked nose, cough, and other cold or allergy symptoms. Generally, the vapours are generated by using hot water or steam.

Recently, another usage of aromatic volatile components has become increasingly popular. Consumers with mental stress often prefer to be in perfumed environments as a way to decrease stress. Due to their ability to induce relaxation and relief of mental stress, certain aromatic volatile components have become popular for treatment and therapy of such stress. These aromatic volatile components (*e.g.*, cineol, jasmine, lavender oil) are known for providing fragranced environments in aroma therapy, as aromatic fragrance components. Herein, "aroma therapy" refers to a therapy which is for mental treatment, getting away from or releasing stress, and inducing relaxation, especially to ease mental stress. A conventional aroma therapy is by an

inhalation of aroma vapours. Aroma is generated from the aromatic fragrance components by using hot water in combination with aromatic actives, or by heating a vessel, for example a pot or a plate, in which aromatic fragrance ingredients and water are placed. Consumers, however, tend to become frustrated with such methods of use, *i.e.*, heating water for aroma vapours and/or steam inhalation, and with cleaning messy vessels due to oily or waxy bases used for aroma generation after the inhalation of aroma vapours.

Certain exothermic reactions have been previously used for the purpose of generating heat or increasing temperature. A variety of products using exothermic reactions are known, for example, in food products (*e.g.*, self-heating meal modules, see Taub et al. U.S. Patent 5,517,981), pharmaceutical products (*e.g.*, body warmers, see Sahara, U.S. Patent 5,220,909), or smoking articles (*e.g.*, cigarette, see Potter et al. U.S. Patent 4,955,399).

Based on the foregoing, there is a need for a method for aroma delivery that comprises heat generation by an exothermic reaction that is effective and convenient for easy use. None of the existing art provides all of the advantages and benefit of the present invention.

SUMMARY

The present invention is directed to a method for aroma delivery comprising the step of applying water to a mixture of an effective amount of an aromatic ingredient, an exothermic ingredient, and a pH adjusting agent, thereby causing the temperature of the mixture to rise and resulting in volatilization of the aromatic ingredients.

These and other features, aspects, and advantages of the present invention will become better understood from a reading of the present disclosure.

DETAILED DESCRIPTION

While the specification concludes with claims particularly pointing out and distinctly claiming the invention, it is believed that the present invention will be better understood from the following description.

All percentages and ratios used hereinafter are by weight of total composition, unless otherwise indicated.

All measurements referred to herein are made at 25°C unless otherwise specified.

All percentages, ratios, and levels of ingredients referred to herein are based on the actual amount of the ingredient, and do not include solvents, fillers, or other materials with which the ingredient may be combined as a commercially available product, unless otherwise indicated.

All publications, patent applications, and issued patents mentioned herein are hereby incorporated in their entirety by reference. Citation of any reference is not an admission regarding any determination as to its availability as prior art to the claimed invention.

Herein, "comprising" means that other steps and other components which do not affect the end result can be added. This term encompasses the terms "consisting of" and "consisting essentially of."

The method for aroma delivery of the present invention can be used in a variety of products in different industrial areas wherein conventional methods of delivering aroma have been previously used, which are, for example, heating or warming. These products are, for example, pharmaceuticals for medical treatment, and aroma therapy products for inducing relaxation and stress release by providing perfumed environments. Further, the method of delivering aroma of the present invention may be used for generating a certain toxin for pest control. Such methods are particularly useful for pharmaceutical products designed for ready inhalation of aromatic actives and fragrance compounds for treatment of cold or allergy symptoms (*e.g.*, cold, blocked nose, and the like).

The method of the present invention further may be used for products designed for body warming, for example, to warm the body to enable pain relief including heating or warming pads. The method may also be used to lessen the stress caused by such pains, at the time of treating the injury by warming the painful areas of the body.

The method further can be useful for a kit product, for example, having two chambers, wherein one chamber contains a mixture of an aromatic ingredient, an exothermic ingredient, and a pH adjusting agent, and the other chamber contains water. A separator, which is located between two chambers, is kept in place until the kit is used. When the separator is removed, water is combined with the mixed ingredients to generate heat, resulting in delivery of aroma.

Therefore the present invention relates to a method for aroma delivery comprising the step of applying water to a mixture of an effective amount of an

aromatic ingredient, an exothermic ingredient, and a pH adjusting agent, thereby causing the temperature of the mixture to rise, resulting in volatilization of the aromatic ingredient.

The method of the present invention includes heat generation comprising a specified concentration of an exothermic ingredient which reacts with water to volatilize an aromatic ingredient.

Preferably, the temperature generated by the reaction of the exothermic ingredients with water is in the range of from about 40°C to about 100°C, more preferably from about 40°C to about 70°C. Without being bound by theory, it is believed that such temperature range is suitable for volatilizing aromatic ingredients including an aromatic active compound, and an aromatic fragrance compound.

The method further includes steam generation which is caused by increasing temperature on the exothermic reaction with water, thereby aroma can be delivered with steam.

A. Aromatic ingredient

"Aromatic ingredient" herein refers to an ingredient which volatizes due to the temperature generated by the reaction of the exothermic ingredients with water, and delivers aroma to the user. The aromatic ingredients useful in the present invention include an aromatic active ingredient, an aromatic fragrance ingredient, and mixtures thereof.

The aromatic ingredient may be provided in any form, for example, as an oil or as a water-oil emulsion. For example, in one embodiment, a kit product using the method of the present invention has two chambers, wherein one chamber contains an aromatic ingredient in emulsion, and another chamber contains an exothermic ingredient and a pH adjusting agent.

"Aromatic active ingredient" herein means an ingredient which is specially used for a medical therapy. The aromatic active ingredient can include any ingredients which are conventionally used as actives for medical treatment, for example, various aromatic actives which may be volatile and useful for treatment of colds, allergy symptoms, and blocked nose in various over-the-counter products. These aromatic actives can be in solid or liquid form.

Nonlimiting examples of the aromatic active ingredient include menthol, eucalyptus oil, camphor, thymol, turpentine oil, l-desoxyephedrine, bornyl acetate, and mixtures thereof.

"Aromatic fragrance ingredient" herein means an ingredient useful in aroma therapy for mental relaxation. Exemplary of the aromatic fragrance ingredients of the present invention include peppermint oil, spearmint oil, lavender oil, citronella oil, lemon oil, orange oil, sandalwood oil, and mixtures thereof.

In certain embodiments, the aromatic active ingredient may further provide preferable fragrance in addition to the vapours for medical treatment purpose.

B. Exothermic ingredients

"Exothermic ingredient" herein means an ingredient which is used for a reaction, called an exothermic reaction, to generate heat on reaction with water. The exothermic ingredients useful in the present invention can be any ingredients which are conventionally used for generating heat on reaction with water, and are available for use in pharmaceutical areas. The exothermic ingredients useful herein include a metal or a metal oxide.

The metals of the present invention include, for example, magnesium and sodium, preferably magnesium. The preferred metal oxides herein are calcium oxide.

Mechanisms of the exothermic reaction using metals differ from the reaction using metal oxides. Theoretically, the exothermic reaction of metal with water requires the presence of an acidic medium. The mechanism of the metal based exothermic reaction is that one mole of metal reacts with two moles of water in the presence of hydrogen ion, thereby one mole of metal hydroxide is derived, with the heat generation enabling volatilization of the aromatic ingredients. The following is an example of the exothermic reaction of the present invention using metal as the exothermic ingredient.

$$M + 2H_2O \xrightarrow{H^+} M(OH)_2 + H_2 \uparrow + \text{Heat} \qquad (I)$$

As shown above, the exothermic reaction (I) using metal with water derives a metal hydroxide with evolution of hydrogen gas. The hydrogen gas is evolved as bubbles and tends to give effervescence, leading to improve aesthetics. It is believed that the hydrogen gas may help the delivery of aroma and give a signal to the user as to the progress of the reaction of the exothermic ingredients with water. At the time when the exothermic reaction is substantially completed, the amount of bubbles evolved decreases.

The quantity of water added based on the exothermic reaction (I) is from about 1:20 to about 1:100, preferably 1:20 to 1:50 to the ratio of metal by weight for generating the temperature appropriate to volatilize the aromatic ingredients. For example, a composition using the method of delivering aroma including about 0.1gm of metal is prepared and by adding about 5 ml (mgs) of water, a maximum temperature of about 68 degC. is generated for volatilizing the aromatic ingredients.

Preferably, the metal is of a high purity, and particularly when the aroma delivery in limited to occur using a large scale exothermic reaction (*e.g.*, four times the amounts of metal and of water shown in the examples herein, as may be useful for providing aroma delivery in a room). It is believed that large scale exothermic reactions, particularly the reaction using magnesium, may cause off-odor or less odor reaction when the metal is of insufficient purity.

When metal oxide is the choice for the exothermic reaction to deliver aroma in the present invention, one mole of water is needed for the reaction with one mole of the metal oxide. In this case, there is no need for the presence of acids such as hydrogen ion for the exothermic reaction. As in the case of reaction (I), one mole of a metal hydroxide is derived, with the appropriate temperature generation to volatilize the aromatic ingredients. The following is an example of the exothermic reaction using metal oxide.

$$MO + H_2O \longrightarrow M(OH)_2 + \text{Heat} \qquad \text{(II)}$$

No gas is evolved by the reaction (II). However, for giving the same aesthetic bubble effect as the hydrogen gas generated by the reaction (I), the exothermic reaction using metal oxide may include an effervescent agent.

The quantity of metal oxide to water based on the exothermic reaction (II) is at least from about 1:2 to about 1:15 by weight, preferably from about 1:2 to about 1:5, for generating the temperature for volatilization of the aromatic ingredients. For example, a composition using the method of delivering aroma including about 1gms of metal oxide is prepared and by adding about 5 ml (mgs) of water, a maximum temperature of about 67 degC. is generated for volatizing the aromatic ingredients.

C. pH adjusting agent

Herein, "pH adjusting agent" means a component which is useful for neutralization of the metal hydroxide derived by the exothermic reaction of the

present invention described by reactions (I) and (II). It is recognized that these metal hydroxides derived from the exothermic ingredients with water tend to provide an undesirable alkaline pH condition, probably a pH of more than about 10. Generally, such pH condition is not safe. Therefore the pH adjusting agent is added to neutralize the metal hydroxides generated during the reaction. The following is a reaction for neutralization.

$$M(OH)_2 + R{-}COOH \longrightarrow RCO{-}OM \qquad (III)$$

The pH adjusting agent useful herein includes any of the acids used for conventional neutralizations. Exemplary of the pH adjusting agent herein are citric acid, oxalic acid, and tartaric acid.

The pH adjusting agent can be added such that the conditions of the composition after aroma delivery are slightly acidic, preferably a pH of from about 3 to about 7. Total amount of the pH adjusting agents to the exothermic ingredients herein may be in the ratio from about 1: 3 to about 1: 6 by weight of the composition. When metal is used as the exothermic ingredient, the weight ratio of the metal to the pH adjusting agent is preferably at least about 1 : 6. When metal oxide is the exothermic ingredient, preferably the pH adjusting agent is at least about 1 : 3 by weight ratio.

D. Additional ingredients

The method of the present invention is useful for a variety of products or compositions in different areas as described above. The compositions or products useful in this method can be formulated in a variety of forms depending upon the desired usage, for example, powder, granules, tablets, packed into bags (*e.g.*, into a tea bag), or a kit comprising two or more chambers. The compositions useful in the method of the present invention may further comprise additional ingredients selected from the group consisting of a carrier, a effervescent agent, a binding agent, a coloring agent, a tableting aid, and mixtures thereof. In embodiments comprising tablet, powder, or granules, the additional ingredients are preferably in a solid form to facilitate operating flowability and product stability.

The additional ingredients must be of sufficiently high purity and of sufficiently low toxicity to obtain the desirable quality to aroma delivered. Additional ingredients other than described below that are useful for the present invention further include, for example, diluents such as glucose, mannitol and

directly compressible sugar; stabilizing agents such as agar, pectin, gums and starches; antioxidants such as ascorbic acid and BHA; preservatives such as potassium sorbate and sodium benzoate, and the like; as well as other non-toxic compatible substances used in pharmaceutical formulation.

1. Effervescent agent

The method of the present invention, especially those using the exothermic reaction (I) to vaporize aromatic ingredients, can evolve gases as discussed above. However reaction (II) does not provide bubbles, but sometimes it may be desirable to have bubbles, for example, for aesthetic purposes. "Effervescent agent" herein means any carbonate salt that provides bubbles when reacted with acid. Generally, the effervescence is evolved by the reaction of a carbonate source with an acidic source, for example, in the combination of a carbonate salt and a carboxylic acid. Any ingredients which would be useful conventionally as an effervescent agent in the pharmaceutical area may be acceptable herein. The effervescent agent of the present invention can be selected depending upon compatibility with other components, particularly the pH adjusting agent which reacts with the effervescent agent. The preferred effervescent agent herein is sodium hydrogencarbonate. The following is one embodiment of the reaction using sodium hydrogencarbonate with citric acids as acidic sources.

$$NaHCO_3 + \text{Citric Acid} \longrightarrow \text{Na—Citrate} + CO_2\uparrow \qquad \text{(IV)}$$

The carbon dioxide is evolved by the reaction (IV) to provide effervescence.

2. Carrier

The composition useful in the method of the present invention, especially that which is in tablet form, may include a carrier. The carrier useful for the compositions herein can be any which is available and conventionally used in pharmaceutical compositions. The carrier can be selected depending upon the compatibility with all of the ingredients included as well as the desired characteristic of the composition. Preferably, the carrier suitable herein is sugar.

The carrier may be added in a variety of forms depending on the form of the composition, preferably the carrier in solid form. For example, when the composition is in tablet form, the carrier may be mixed with other ingredients

such as the exothermic ingredient and the pH adjusting ingredient during granulation.

The carrier is present at an effective level, preferably at a level of from about 10% to about 70% by weight. Preferably, the carrier may be added to each of main ingredients such as the exothermic ingredient and the pH adjusting agent separately before mixing, to facilitate the process for making granules and/or tableting. Preferably, the ratio of such ingredients to the carrier is about 50:50.

3. Binding agent

The composition useful in the method of the present invention may also include a binding agent. Inclusion of a binding agent is particularly useful to bind the components used for tablet forms of the composition. It is believed that insufficiencies in binding ability tend to cause compositions in tablet form, and especially those having a disc type shape, to break off into two pieces along the diameter during the manufacturing process. This splitting of the tablet is commonly referred to as "capping." The levels and types of binding agent are selected depending upon compatibility with other components, and desired characteristic of the final product.

Examples of useful binding agents include sugar, sugar alcohols, starches such as starch paste and pregelatinized starch, polyvinylpyrrolidone, cellulose derivatives, gelatin, gums, and mixtures thereof. In certain embodiments, especially the tablets, the binding agent and the carrier may be made of the same material. Alternatively, the binding agent and the carrier may be altogether different. It is believed that the binding agent contributes to stability of the granules when added in the process of making granules.

The binding agents may be present in an effective amount, preferably from about 0.1% to about 10% by weight, more preferably from about 0.5% to about 3%.

4. Coloring agent

The composition useful in the method of the present invention may further include a coloring agent. The coloring agent may be present at an effective level, preferably from about 10 ppm to about 500 ppm, more preferably from about 20 ppm to about 250 ppm by weight.

5. Tableting aids

When the composition useful in the method of the present invention is in tablet form, tableting aids can be added in order to facilitate forming the tablets. Herein, "tableting aids" refers to an ingredient that is added to the granules in small quantities to improve flowability to the granules, to reduce friction, and/or to ease removal of the tablets from the tableting machine. The tableting aids useful herein include, for example, magnesium stearate, stearic acid, aerosol, talc, and mixtures thereof. The tableting aid of the compositions of the present invention, is preferably present in an amount sufficient to prevent the tablet from breaking into two pieces, preferably from about 0.1% to about 8%, by weight of the tablet.

EXAMPLE

The following examples further describe and demonstrate embodiments within the scope of the present invention. The examples are given solely for the purpose of illustration and are not to be construed as limitations of the present invention, as many variations thereof are possible without departing from the spirit and scope of the invention.

The components shown below can be prepared by any conventional method well known in the art. Suitable formulations are as follows:

(wt%)

	Example I	Example II	Example III	Example IV	Example V
product type	tea bag 1	tea bag 2	powder 1	powder 2	tablet
calcium oxide	23.54	-	23.54	-	-
magnesium	-	13.06	-	13.06	-
Mg-granules	-	-	-	-	13.3
NaHCO3	-	-	1.25	-	-
Citric acid	71.86	78.36	70.61	78.36	-
Citric-granules	-	-	-	-	79.82
Menthol	3.1	7.36	3.1	7.36	3.75
Spearmint oil	1.5	1.22	1.5	1.22	0.63
Aerosil	-	-	-	-	2.5
Total	100.0	100.0	100.0	100.0	100.0

Mg-granules containing 1:1 of magnesium and sugar.

Citric-granules containing 1:1 of citric acid and sugar.

Pack 5gms mixture of Example 1 formulation and 2.04gms mixture of Example 2 formulation into Tea bag 1 and Tea bag 2, respectively for making tea bag type products.

Example 3 and 4 are mixed for making powder type products (powder 1 and 2, respectively).

4.0mg mixture of Example 5 formulation is compressed into tablet form.

Example I Use of tea bag 1

Put the tea bag 1 made by Example 1 formulation into a cup containing about 5ml of water, whereby heat is generated in the range from about 40 to about 70 degC., and inhale an aroma vapours delivered.

Example II Use of tea bag 2

Put the tea bag 2 made by Example 2 formulation into a cup containing about 5ml of water, whereby heat is generated in the range from about 40 to about 70 degC., and inhale the aroma vapours delivered.

	tea bag 1	tea bag 2
mixture portions in tea bag (gm)	5.0	2.04
water (ml)	5.0	5.0
temperature (°C)	40 - 70	40 - 70

Example III Use of powder 1

Prepare 3 cups (A, B, and C) and fill these cups with about 5.0, 2.0, and 15.0 ml of water, respectively. Add about 5 gm of Powder 1 (Example 3 formulation) to each of these cups. Heat is generated having maximum temperature about 67 degC. for cup A, about 78 degC. for cup B, and about 55 degC. for cup C. Inhale the vapours of aroma delivered.

Example IV Use of powder 2

Prepare 3 cups (D, E, and F) and fill these cups with about 5.0, 2.0, and 10.0 ml of water, respectively. Add about 0.765 gm of Powder 2 (Example 4 formulation) to each of these cups. Heat is generated having maximum temperature about 68 degC. for cup D, about 89 degC. for cup E, and about 50 d gC. for cup F. Inhale the vapours of aroma delivered.

cup	A	B	C	D	E	F
	powder1	powder1	powder1	powder2	powder2	powder2
mixture parts(gm)	5.0	5.0	5.0	0.765	0.765	0.765
water (ml)	5.0	2.0	15.0	5.0	2.0	10.0
temperature (°C)	max 67	max 78	max 55	max 68	max 89	max 50

Example V Use of tablet

Fill a cup with about 14.0 ml of water. Add one tablet (4.0gm; Example 5 formulation) into the cup. After about 2 minutes, the heat generation suddenly increases to a maximum temperature of about 79 degC. Inhale the vapours of aroma delivered.

The embodiments disclosed and represented by the previous examples have many advantages. For example, they can provide effective aroma delivery that is both aesthetically desirable and convenient to use.

It is understood that the foregoing detailed description of examples and embodiments of the present invention are given merely by way of illustration, and that numerous modifications and variations may become apparent to those skilled in the art without departing from the spirit and scope of the invention; and such apparent modifications and variations are to be included in the scope of the appended claims.

What is claimed is:

1. A method for delivering aroma comprising the step of applying water to a mixture of an effective amount of an aromatic ingredient, an exothermic ingredient, and a pH adjusting agent, thereby causing the temperature of the mixture to rise and resulting in volatilization of the aromatic ingredients.

2. The method of Claim 1, wherein the aroma is delivered by steam.

3. The method of Claim 1, wherein the temperature rises to about 40°C to about 100°C for volatilizing the aromatic ingredients.

4. The method of Claim 3, wherein the aromatic ingredient is selected from the group consisting of an aromatic active ingredient, an aromatic fragrance ingredient, and mixtures thereof.

5. The method of Claim 4, wherein the exothermic ingredient is selected from the group consisting of a metal and a metal oxide.

6. The method of Claim 5, wherein the ratio of the metal to the water from about 1:20 to about 1:150 by weight.

7. The method of Claim 5, wherein the ratio of the metal oxide to the water is from about 1 : 0.4 to about 1 : 15 by weight.

8. The method of Claim 5, wherein a resulting composition derived from the exothermic ingredient and the pH adjusting agent has a pH of from about 3 to about 7.

9. A method for delivering aroma comprising the steps of:

   (a) providing an aromatic ingredient, an exothermic ingredient, and a pH adjusting agent in a first chamber;

(b) providing water in a second chamber separated from the first chamber;

(c) combining the first and the second chambers when aroma delivery is desired, wherein an exothermic reaction is generated, and aroma is delivered.

10. A method for delivering aroma comprising the steps of:

(a) providing an exothermic ingredient and a pH adjusting agent in a first chamber;

(b) providing an aromatic ingredient and water in a second chamber separated from the first chamber;

(c) combining the first and the second chambers when aroma delivery is desired, wherein an exothermic reaction is generated, and aroma is delivered.

INTERNATIONAL SEARCH REPORT

Inte .onal Application No
PCT/US 98/05582

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61L9/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DATABASE WPI Section Ch, Week 9744 Derwent Publications Ltd., London, GB; Class C07, AN 97-474271 XP002084949 & JP 09 220045 A (CHUGAI CHEM KOGYO KK) , 26 August 1997 see abstract ---	1-7
X	PATENT ABSTRACTS OF JAPAN vol. 018, no. 433 (C-1237), 12 August 1994 & JP 06 134025 A (SUNSTAR INC), 17 May 1994 see abstract --- -/--	1-7

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
18 November 1998	30/11/1998

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Int. ional Application No
PCT/US 98/05582

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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